

We Claim:

1. A method for separating particles in a medium, the particles having differing dielectric constants, comprising the steps of:

providing a medium having a dielectric constant between the dielectric constants of
5 the particles,

subjecting the particles in the media to an optical gradient field, and
separating the particles.

2. The method of claim 1 wherein the optical gradient field comprises an
10 expanding optical gradient field.

3. The method of claim 2 wherein the expanding optical gradient field constitutes an expanding area of illumination.

4. The method of claim 1 wherein the illumination has a constant intensity.
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5. The method of claim 1 wherein the optical gradient field comprises a moving optical gradient field.

6. The method of claim 5 wherein the moving optical gradient field includes a jerk motion.
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7. The method of claim 1 wherein the optical gradient field increases monotonically.
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8. The method of claim 7 wherein the monotonic increase is linear.

9. The method of claim 7 wherein the monotonic increase is not linear.

10. The method of claim 1 wherein the separation occurs in media on a slide.
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11. The method of claim 1 wherein the separation occurs in a microfluidic channel.

12. The method of claim 11 wherein the microfluidic channel includes a T junction.

5 13. The method of claim 11 wherein the microfluidic channel includes a Y junction.

14. The method of claim 11 wherein the microfluidic channel includes a H junction.

10 15. The method of claim 11 wherein the microfluidic channel includes a X junction.

16. The method of claim 11 wherein the separation occurs at two or more junctions.

17. The method of claim 1 wherein the separation is based solely on the application of the optical gradient field.

20 18. A method for determining the dielectric constant of a particle comprising the steps of:

subjecting the particle to an optical gradient force in a plurality of media having different dielectric constants,

25 monitoring the motion of the particle when subject to the optical gradient force in the various media, and

determining the dielectric constant of the particle based upon the relative motion in the various media.

30 19. The method of claim 18 wherein the media are in different vessels.

20. The method of claim 18 wherein the media gradient is in one vessel.

21. The method of claim 20 wherein the vessel is a tube.

22. The method of claim 21 wherein the tube has a gradient of dielectric constant along its length.